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[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#)  
[Z](#)



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(12) Patent:

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(54) ROLLER PRESS, ESPECIALLY A WASHING PRESS FOR PAPER MACHINE FELTS

(54)

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### ABSTRACT:

CLAIMS: [Show all claims](#)

\*\*\* Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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## ABSTRACT OF THE DISCLOSURE

The specification discloses a roller press for pressing out a web, such as a felt and having two larger pressure rollers rotating on parallel axes and spaced apart and a smaller intermediate roller which is located between the two larger pressure rollers so as to define two nips. Said smaller intermediate roller is offset to one side of the common plane containing the axes of the two larger rollers. The web to be pressed out passes through the first nip between the larger roller and the intermediate roller, directly envelopes the smaller roller and then goes back through the second nip thus forming the entire support for the smaller roller. The smaller roller may be formed in axial segments rotatable relative to each other and contoured to compensate for improper movement of the web. A suction box can be coordinated to the press to exert suction on the press in the region where the web passes around the smaller intermediate roller. The two pressure rollers can be interconnected so the roller on the side where the web leaves the press runs slightly faster than the pressure roller where the web enters the press and whereby the web is additionally tensioned within the press. At least one of the larger pressure rollers can be peripherally grooved and the intermediate roller can be perforated and have air supplied to the inside thereof while, furthermore, the larger pressure rollers can be perforated and subjected to internal suction. The larger rollers may be provided with deflection compensating devices.

The present invention relates to a roller press for pressing out wet paper machine felts.

Washing presses of the nature referred to comprise rollers between which a web in the form of a felt is passed and wherein the web is pressed under pressure to express water or other liquid from the web.

In paper making machines, presses of the nature referred to are located in the return path of the press felt to press water therefrom, which is picked up from the paper web, or which is in the felt because of the washing of the felt. In the textile industry such presses are employed  
10 for processing out webs of cloth after dyeing.

In the text of the present application the term "web" will be understood to refer to textile members of substantial strength in tension, such as cloth webs, or papermakers felts, and, particularly, the latter.

In the operation of the presses of the nature referred to, the press rollers are subjected to considerable radial forces which provoke their bending during operation, and which results in an unevenness of the nip pressure over the length of nip. In order to overcome these disadvantages it has already become known to provide such press rollers with devices for altering the convexity or crown of the respective roller according to the  
20 applied pressure. However, those devices are involved and expensive.

In presses according to the prior art, some considerable difficulty has been encountered in removing one web and inserting another web.

With the foregoing in mind, a primary objective of the present invention is the provision of an improved roller press of the nature referred to.

Another object of the present invention is the provision of a roller press which provides for the developing of the desired constant nip pressure across the entire width of the web being processed, without the necessity of using devices of the said nature.



for altering the crown of the roller.

It is also an object of the present invention to provide a press arrangement in which the removing of one web and the installing of another web is easy to accomplish.

BRIEF SUMMARY OF THE INVENTION:

The present invention, in brief, provides a press which employs two large pressure rollers rotating in spaced relation on parallel axes, and an intermediate roller smaller in diameter than the first two mentioned rollers, whereby said smaller roller forms 10 a nip with each of the two large pressure rollers. The web to be pressed out enters the first nip from the side opposite the smaller roller, then directly envelopes the intermediate roller and passes through the second nip towards said opposite side of the smaller roller.

The pressure exerted on the web where it passes between the smaller intermediate roller and the larger rollers squeezes the water or other liquid from the web which can then be removed in any suitable manner.

DISCUSSION OF THE INVENTION:

20 The problem of roller deflection, especially in respect of the smaller intermediate roller is solved by the present invention by permitting the intermediate roller to float in the direction toward and away from the gap between the larger rollers and entraining the web around the smaller roller and exerting tension on the web so that the smaller intermediate roller is pulled toward the two larger pressure rollers, and in this manner the required line pressure between the smaller roller and the

larger rollers is created.

In the arrangement according to the present invention, the smaller intermediate roller is not provided with radial bearings, but is kept in operative position pressed against the two larger pressure rollers solely by the loop of the web which passes around the intermediate roller. Inasmuch as the web tension creates a substantially linear load on the intermediate roller, even if the curvature of the intermediate roller is at fault, it will still make close contact with the larger pressure rollers and the line pressure across the width of the web where the smaller roller engages the larger pressure rollers will be more or less uniform.

Further, inasmuch as the space between the larger pressure rollers in which the intermediate roller is located is wedged shaped, the line pressure created between the smaller roller and the larger rollers is a multiple of the web tension so that, in most cases, no further pressure applying devices are required to develop the desired contacting pressure on the web. Such further devices could, if desired, be supplied.

An advantage of arranging the intermediate roller so that it is free of radial support, except for the loop of the web, is to be found in the fact that alien bodies, i.e., particles of dirt and the like, entrained by the web will merely cause the intermediate roller to yield, thereby preventing any damage to the rollers or to the web being processed.

It has been found that the smaller intermediate roller and the two larger pressure rollers can be constructed without a resilient coating of rubber, or rubber-like material, as has been commonly done in the prior art and because of the absence of

resilience in the roll surfaces, less power is required for driving the press according to the present invention than has heretofore been required for presses according to the prior art. In general, due to the freedom with which the rollers rotate the web itself, can often form the sole driving arrangement for the press.

A further advantage of the arrangement of the intermediate roller so as to be free of radial bearings, is realized when the felt or web is exchanged. The web is merely loosened and the intermediate roller is pulled out from the web loop in the direction of its length and the processed web can easily be removed and another web to be processed can be installed. Similarly, the smaller intermediate roller can readily be exchanged for one of a different character, if so desired.

While the intermediate roller is free of radial restraint in the form of radial bearings, it is preferable to provide an axial bearing arrangement at each end of the intermediate roller to prevent undesired axial shifting thereof.

The present invention further contemplates an additional tensioning of the web directly within the press by interconnecting the two larger pressure rollers with a drive arrangement such that the pressure roller at the exit side of the press, namely, where the web leaves the press, runs at a peripheral speed higher than the other pressure roller where the web enters the press. By imparting to the web at the exit side of the press and at the second pressure region, a greater velocity than the web has where it enters the press at the first pressure region, the web undergoes an additional tensioning as it passes around the smaller intermediate roller and the pressure inside the pressure slits defined between the intermediate roller and the larger pressure

rollers is increased over the value that would ordinarily occur merely because of tension exerted on the web externally of the press. Such additional tensioning of the web does not, of course, act on the web externally of the press so that idler rollers and the like guiding the web to and from the press are not loaded by the above mentioned additional web tensioning arrangement.

It has been found advisable, in certain circumstances, to provide a suction box associated with the press and acting on the web, in at least the region thereof passing around the intermediate roller. Such a suction box assists in extracting liquid from the web and the action of the suction box is enhanced by the centrifugal force acting on the liquid in the web as it passes about the intermediate roller.

By providing at least one of the two larger pressure rollers with circumferential grooves and by extending the suction box to cover a part of such a grooved roller after it leaves the web, liquid will be aspirated from the grooves leading into the pressure region and wetting of the web after it leaves the pressure region is thereby prevented. Such grooves might, for example, be from about 0.8 to about 5 millimeters wide and from 1 to about 8 millimeters deep and have an axial spacing from about 2 to 8 millimeters. Such grooves, preferably, are segmented in form and are arranged in the peripheral direction, one behind the other, with each segment being from about 30 to 100 millimeters long.

It is contemplated that the intermediate roller may be provided with bores to which air is supplied, under pressure, from internally of the intermediate roller which will push liquid from the web and which bores could cooperate with the grooves in the pressure roller to improve the aspiration from water to the grooves.

There can be used with the suction box, or separately therefrom, a space on the side of the intermediate roller facing the gap between the larger pressure rollers which is maintained at an elevated pressure. This can be accomplished by using a fourth roller extending parallel to the other rollers and located between the incoming and outgoing reaches of the web to form a seal therebetween.

Still further, the two larger pressure rollers could be perforated and be subjected to internal suction, thereby operating 10 as suction rollers.

It is desirable to prevent an exchange of moisture between the entering reach of the web and the departing reach thereof and this is accomplished by the use of a splash guard extending into the space between the two larger pressure rollers. Such a splash guard can be constructed of a flexible material, such as rubber or the like, or it can be a relatively rigid material and thereby serve as a safety stop to prevent the smaller intermediate roller from moving upwardly too far.

As a stop for preventing the intermediate roller from 20 moving too far in the space between the larger pressure rollers, not only is it possible to employ the aforementioned splash guard but an additional roller for this purpose, or other stationary stop member could be provided.

Since some curving or deflection of the rollers will take place due to the development of pressure thereon during operation of the press, the axles or support shafts, for the larger pressure rollers may be subjected to a force spaced axially from the bearings thereon and directed in such a direction as to compensate for roller deflection.

It is contemplated that the smaller intermediate roller can be constructed of axial sections or segments which are mounted on a common axis and rotatable relative to each other. Such segmented rollers permit adjustment of the diameter of the various segments to compensate for any tendency of a web to take an irregular motion. Thus, the center of a web might try to move ahead of the lateral edges of the web because of deflection of the rollers.

Erratic running of the web can be compensated by forming the segments of the intermediate roller to different diameters and different configurations so that uniform constant velocity can be imparted to the web across its entire width, while still maintaining operative pressure on the web in each pressure slit. The individual portions or segments of the intermediate roller can be formed cylindrically to different diameters, or can be slightly conical, for example.

It is preferable to make the segments of the intermediate roller relatively short to eliminate too great a velocity change of the web across the axial length of any given segment.

By accommodating the intermediate roller in this manner to the resilience of the web, or felt, passing through the press, the central portions or segments of the intermediate roller can be made rather long; whereas, the end portions are relatively short in the axial direction. Such specially shaped intermediate rollers readily compensate for irregular travel of the web.

When a specially shaped intermediate roller of the nature referred to is employed with the larger pressure rollers having deflection compensating devices associated therewith, particularly beneficial results are obtained because the smaller intermediate

roller generally compensates for improper travel of the web and the devices for compensating for deflection of the main pressure rollers effect fine adjustment in respect of web travel. Such fine adjustment might be dispensed with if a number of intermediate rollers of different types were employed.

The exact nature of the present invention will be more fully comprehended upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

10

Figure 1 is a somewhat schematic end view of a washing press for a paper machine felt;

Figure 2 is a view similar to Figure 1, which shows the incorporation of a suction box in the press;

Figure 3 is a plan view of a washing press showing one arrangement for compensating for deflection of the larger pressure rollers;

Figure 4 is an end view of the press of Figure 3;

20

Figure 5 is a view like Figure 4, but shows a different arrangement of the devices for compensating for deflection of the pressure rollers;

Figure 6 is a view similar to Figure 3, but shows a differential drive arrangement connecting the pressure rollers; and

Figures 7, 8 and 9 are elevational views showing intermediate rollers which are made up of segments and have different contours, the contours of the intermediate rollers in these Figures being exaggerated for the sake of clarity.

#### DETAILED DESCRIPTION OF THE INVENTION:

Referring to Figure 1, the washing press shown therein

is provided with two larger pressure rollers 1 and 2, of which roller 1 is provided with peripheral grooves 3. Nozzles 4 are provided directing compressed air against the periphery of roller 1 in such a direction as to strip liquid from the grooves 3. A scraper or doctor blade 5 can also be provided which is also operable for stripping liquid from roller 1.

A smaller intermediate roller 6 is provided beneath the plane containing the axes of rollers 1 and 2 and of a diameter larger than the radial gap between the opposed sides of rollers 1 and 2. According to the present invention, intermediate roller 6 is free of radial restraint and is supported solely by the loop of the web 7, which passes around roller 6. Web 7 passes to and from the press from the side of the plane containing the axes of rollers 1 and 2, which is opposite roller 6.

There is preferably provided a stationary transverse beam extending parallel to the rollers and having attached thereto a planar member 9 which extends downwardly into the space between rollers 1 and 2 and which may terminate adjacent to but spaced from roller 6. Planar member 9 may be rubber, or rubber like, and serve purely as a splash shield to prevent moisture from being transferred from the incoming reach of web 7 to the outgoing reach thereof, but it may also be in the form of a rigid member and serve as a stop to prevent roller 6 from moving upwardly too far into the space between rollers 1 and 2.

With roller 6 free of radial restraint, it is also advisable to place a member 10 beneath roller 6, which prevents the roller from dropping to the floor in case web 7 becomes torn for any reason.

While roller 6 is free of radial restraint and is sup-

ported in operative position solely by the web passing about the roller, it is preferable to restrain roller 6 in the axial direction. As will be seen in Figures 3 and 6, this can readily be done by the bearing members 29 stationarily mounted at each end of intermediate roller 6.

In the arrangement of Figure 2, the same press is illustrated as shown in Figure 1, but it will be seen further to be provided with a suction box 13. Sealing members 14 and 15 engage the surfaces of rollers 1 and 2 and substantially seal the suction box at the side edges. Connections 16 and 17 may be provided for connecting box 13 to a source of suction. Furthermore, there may be a liquid drain line leading from the suction box.  
10

In the arrangement of Figures 3 and 4, the axles, or shafts, for pressure rollers 1 and 2 are supported in stationary bearings 20 and 21, which are fixed to a base plate, or foundation member, 23. In order to compensate for deflection of pressure rollers 1 and 2 when the press is operating, the outer ends 24 and 25 of the roller axles are provided with bearings 26 and 27 spaced outwardly from bearings 20 and 21 and having interposed therebetween a pressure creating device, such as the pneumatic bellows 28.  
20

It will be evident that a supply of pressure to bellows 28 will compensate for deflection of the rollers due to the pressure exerted thereon by the web being processed.

The arrangement of Figures 3 and 4, represents a simple arrangement for bellows 28 but the deflection of each of pressure rollers 1 and 2, because of the pressure exerted thereon by the webs, is actually substantially at the angle of the plane passing through the axis of the intermediate roller and the axis of the

respective pressure roller.

With this in mind, the single bellows 28 at each end of the pressure rollers 1 and 2 in Figures 3 and 4 is replaced in Figure 5 by the angularly arranged individual bellows 28' at each end of each of the pressure rollers. Bellows 28' rest on the inclined surfaces 31 and 32 of a block 30 mounted on foundation member 23. The forces exerted by bellows 28' through bearings 26 and 27, impart to the rollers compensating forces in the same plane as the deflecting forces acting thereon.

10 In Figure 6, the axles for the pressure rollers 1 and 2 are interconnected by a differential drive arrangement, including jointed shaft 34 connected to axle 24 of pressure roller 1 and jointed shaft 35 connected to axle 25 of pressure roller 2. A pulley 36 connected to jointed shaft 34 is drivingly connected, as by a belt, with a pulley 37 connected to jointed shaft 35. Pulley 36 is from about one-half percent to three percent larger in diameter than pulley 37, thereby causing pulley 37 to run faster than pulley 36. Pressure roller 2 is thereby driven at a higher peripheral speed than pressure roller 1 and develops added tension  
20 on the loop of the web passing around intermediate roller 6.

The added tension on the web in the region of the press is not, however, imparted to the web outside the press but, rather, is confined to the web within the press.

In Figures 7, 8 and 9, the intermediate roller is illustrated and is designated generally at 46, 56 and 66, respectively. In these Figures, the intermediate roller has a profile other than cylindrical, the profile, in each case, being exaggerated for illustrative purposes. Each of the intermediate rollers in Figures 7, 8 and 9 is made of axial portions or segments

which are rotatable relative to each other.

In Figure 7, the intermediate roller comprises a cylindrical central segment and end segments which taper inwardly toward the outer end of the roll.

In Figure 8, the roll comprises a relatively long central segment with inwardly tapering segments at the ends of the central segments and substantially cylindrical segments at the extreme ends.

In Figure 9, the central segment of the roll is cylindrical and the end segments taper inwardly toward the ends of the intermediate roller.

The contours of the intermediate rollers in Figures 7 to 9 are smooth from end to end of the roller and correspond substantially to the outline of the so-called "felt bar mark" of the individual felt of the paper machine before it enters the washing press.

Modifications may be made falling within the scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Roller press for squeezing liquid from a moist web of textile material which is tensioned in the direction of the length thereof, the press having two pressure rollers with the axes thereof parallel and at right angles to the direction of the length of said web and spaced so as to leave a gap between the pressure rollers, said press also having an intermediate roller of substantially smaller diameter than that of either pressure roller but larger in diameter than the gap between said pressure rollers, said intermediate roller being located between the pressure rollers and offset to one side of the common plane containing the axes of the two pressure rollers, so as to define two nips with the said pressure rollers, the press being arranged such that the web runs in the direction of the length thereof into the first nip from the side of the said common axial plane remote from the intermediate roller and leaves the second nip towards said remote side of the common axial plane and directly envelopes the intermediate roller from the first nip to the second nip, said intermediate roller being supported solely by the web passing therearound.
2. A roller press according to Claim 1, which includes means to prevent axial movement of said intermediate roller while permitting free movement thereof in the radial direction under the influence of the said web entrained therearound.
3. A roller press according to Claim 1 or 2, which includes drive means interconnecting said pressure rollers and driving the pressure roller on the side of the press where said web leaves the press at a peripheral speed higher than the peripheral speed of the pressure roller on the side of the press where said web enters the press.
4. A roller press according to Claim 1 or 2, which includes suction box means sealingly engaging said pressure rollers on each

side of said intermediate roller and operable to develop suction on the region of the web entrained about said intermediate roller between said first and second nips.

5. A roller press according to Claim 1 or 2, which includes a planar member disposed in the gap between said pressure rollers and extending from the side of the gap opposite said intermediate roller through the gap toward said intermediate roller and preventing the exchange of moisture between the reaches of the web on opposite sides thereof.

6. A roller press according to Claim 1 or 2, which includes stop means disposed between said intermediate roller and the plane of the axes of said pressure rollers to limit the movement of said intermediate roller in the direction toward said plane.

7. A roller press according to Claim 1 or 2, which includes a planar member disposed in the gap between said pressure rollers and extending from the side of the gap opposite said intermediate roller through the gap toward said intermediate roller and preventing the exchange of moisture between the reaches of the web on opposite sides thereof, said planar member being substantially rigid and serving also as a stop to limit the movement of said intermediate roller in the direction toward said plane.

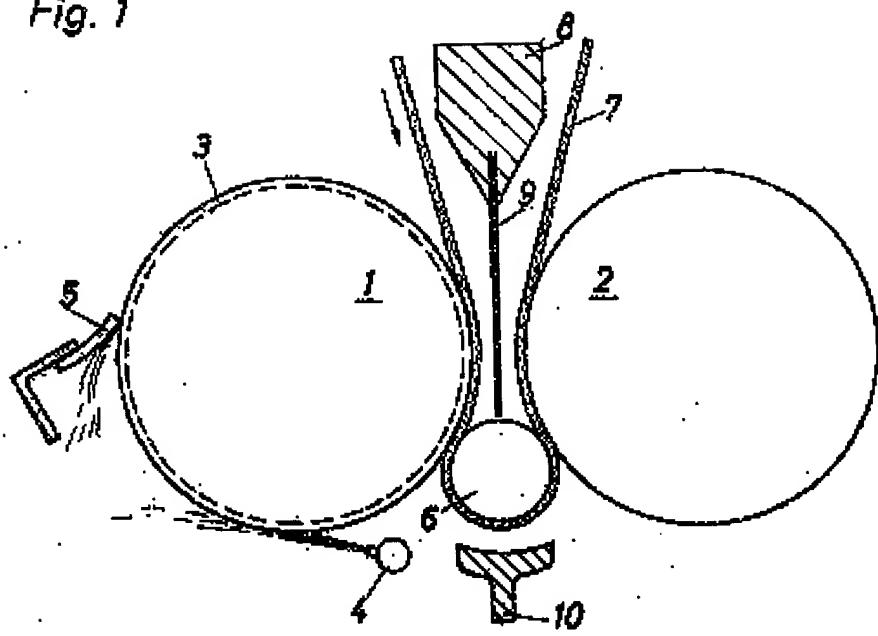
8. A roller press according to Claim 1 or 2, which includes support shafts for the pressure rollers, stationary bearings providing radial support for said support shafts, and means engaging said support shafts at points therealong located on the opposite sides of said bearings from said rollers and operable to exert forces on said shafts at right angles to the axes of said shafts

and in a direction to compensate for deflection of said rollers due to the pressure exerted thereon by said web.

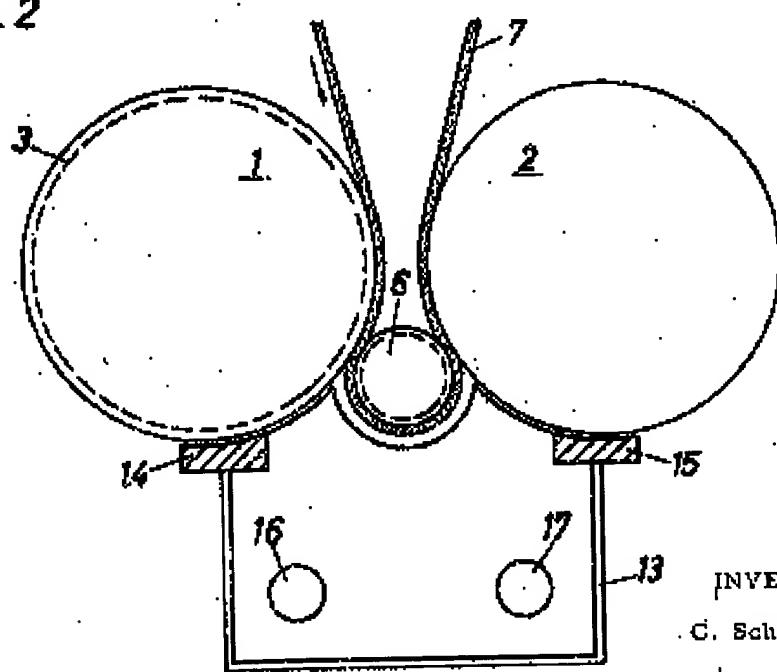
9. A roller press according to Claim 1 or 2, in which said intermediate roller is made up of a plurality of axial segments.

10. A roller press according to Claim 1 or 2, in which said intermediate roller is made up of a plurality of axial segments, said axial segments being free to rotate relative to each other, said segments being contoured to impart a predetermined smooth contour to said intermediate roller such that the diameter of the intermediate roller varies along the length thereof.

*Fig. 1*



*Fig. 2*



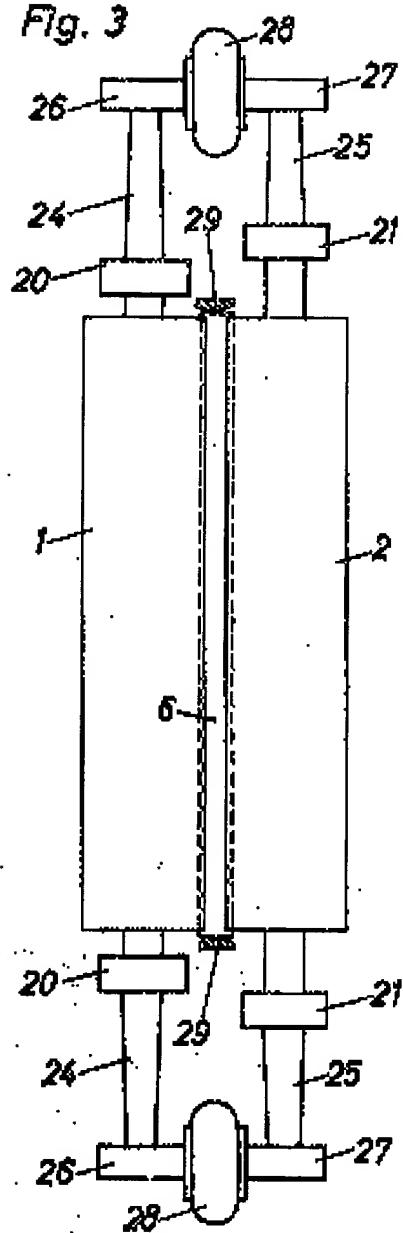
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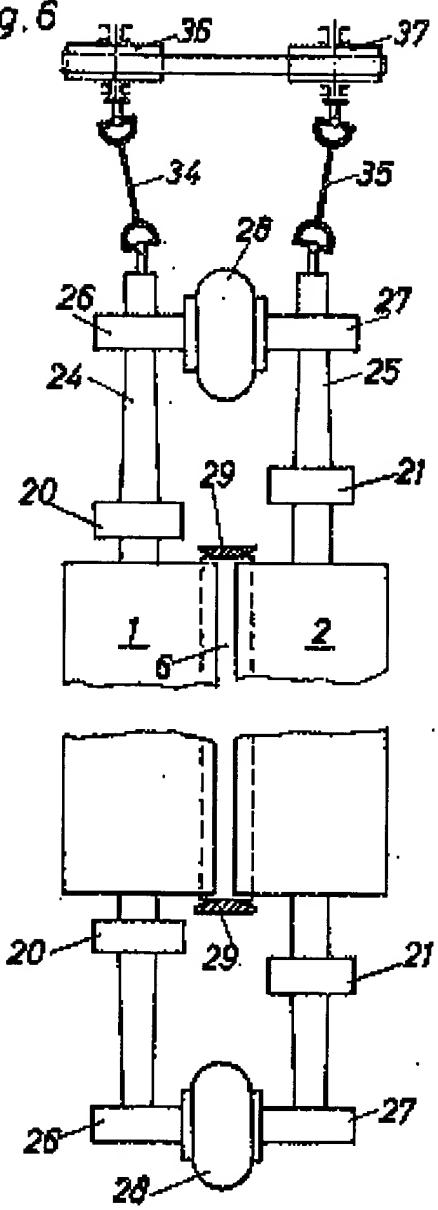
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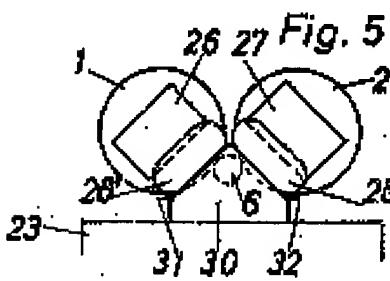
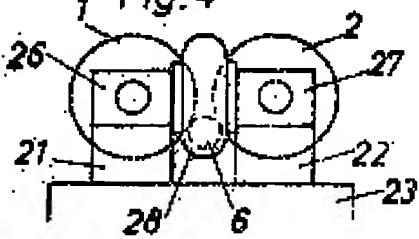
*Fig. 3*



*Fig. 6*



*Fig. 4*

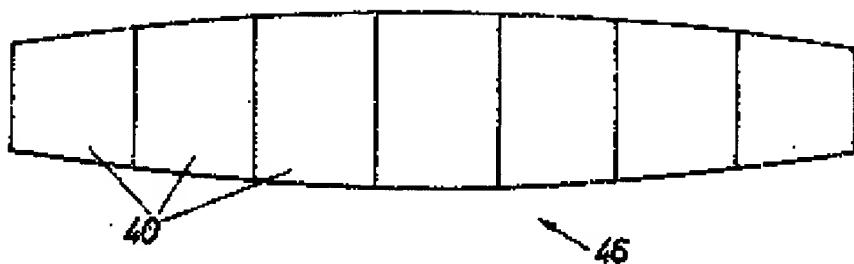


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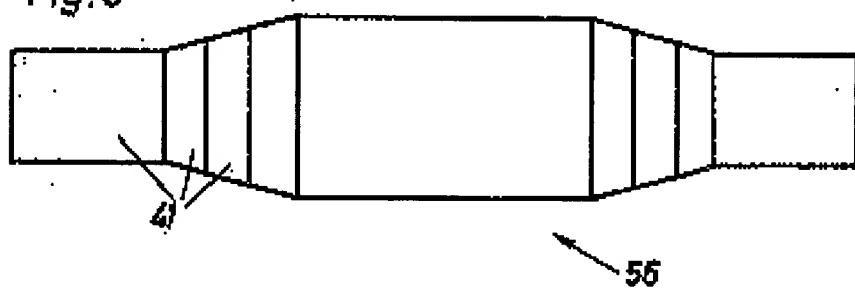
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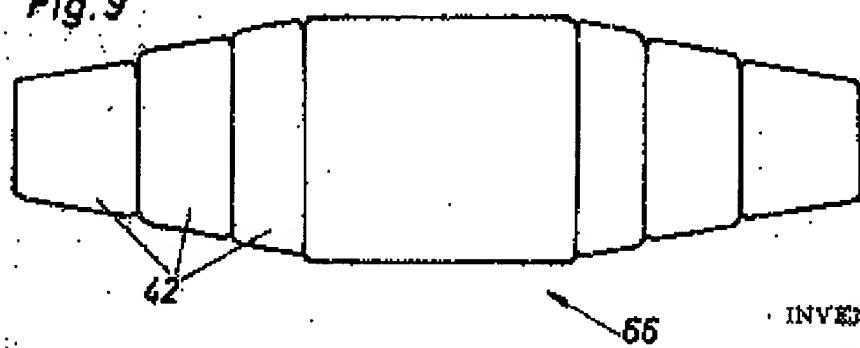
*Fig. 7*



*Fig. 8*



*Fig. 9*



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